



March 10, 2011

Phillip Isenberg, Chairman
Delta Stewardship Council
980 9th Street, Suite 1500
Sacramento, CA 95814

Dear Chair Isenberg and Members of the Council:

American Rivers would like to complement Council and Staff on the preparation of Draft One of the Delta Plan and on the attempts to address such a complex problem with many competing interests. American Rivers works to protect and restore rivers for the benefit of human and natural communities. We sincerely believe that protecting public safety must be our highest priority. Failure to make the hard choices today that are necessary to protect future generations from the very real risk of catastrophic floods will impoverish the future of all communities who depend upon the Delta and the rivers that flow into it – including the natural communities that have persisted along the rivers for eons.

In that spirit, we offer the following comments with respect to Chapter 8 of the Draft Plan, “Reduce Risks to People, Property, and State Interests in the Delta.” Attached are general comments and specific recommendations that, if incorporated, would significantly reduce flood risk in the Delta. We plan to comment on other elements of the plan in the near future.

As you proceed, we urge you to avoid the mistake of assuming that humans can control risk by controlling floods. In that vein, we highlight line 31 on page 8-4, which reads, “Levees do not eliminate risk—levees reduce risk.” This statement is incorrect. Levees do not reduce risk. Flood risk is the *probability* of flooding times the *consequences* of flooding. Levees reduce only the *probability* of flooding, and unfortunately in most cases, they actually increase the *consequences* of flooding because FEMA-certified levees allow for dense urban development on floodplains that will eventually flood deeply. Undeveloped farmland that is not “protected” by a levee presents far less risk than a subdivision protected by a 100-year or 200-year levee.

“Effective emergency response preparedness” and “strategic levee investments,” are both critical *and* necessary, but not sufficient. If California were faced with an ARkStorm type scenario similar to the great storm of 1862 with massive, destructive, and widespread flooding, all bets are off. *No matter how coordinated* a multi-jurisdictional Response Plan, and regardless of how trained and skilled the responders, emergency response on such a scale may not materialize, and levee systems even if strengthened, may not be adequate.

Land use and building codes are the critical factor that affects not only the probability, but also the consequences of floods. Residential development behind levees is a threat to public safety. Reinforcing existing levees to allow new development, particularly along existing floodways increases flood risk by (1) sending flood waters downstream toward other urban communities,

(2) restricting the natural ability of floodplains to safely convey floodwaters, and (3) placing more people and property in harm's way so when the larger flood occurs or a when a levee fails, consequences are greater than were the levee not there, and (4) precluding floodplain restoration that could better reduce flood risk and restore ecological function.

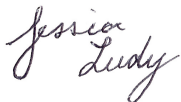
American Rivers recommends four overarching actions. Please see our attached comments for details.

- I.** Prevent floodplain development in the Delta behind both riverine levees and estuarine levees;
- II.** Expand flood conveyance capacity in the Delta and give rivers more room to flood by expanding our bypass system and restoring floodplains;
- III.** Reduce peak inflows into the heart of the Delta through upstream floodplain storage in rural basins;
- IV.** Minimize residual risk in existing communities behind levees, and where development is already permitted, ensure that future risks are full disclosed and accounted for with sustainable financing mechanisms for future levee maintenance, improvements, and emergency preparedness that will be needed as our climate changes.

These actions work together to minimize loss of life from flooding which should be the number one priority for the Delta plan with respect to risk. These actions work together with effective emergency response and strategic levee investments to reduce property and infrastructural damage, as well as to reduce the financial burden of disasters on individuals, and local, regional, state, and federal governments.

Thank you for providing this opportunity to comment. Please contact us if you have any question or would like more detail on our recommendations.

Sincerely,



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Flood Management Associate



John Cain
Director for Central Valley Flood Management



Comments of American Rivers Delta Plan Draft #1: Chapter 8

Reduce Risks to People, Property, and State Interests in the Delta

I. Prevent floodplain development in the Delta behind both riverine levees¹ and estuarine levees².

Development of riverine floodplains increases flood risk and precludes opportunities to both improve public safety and restore critical ecosystem function. Reinforcing existing levees or constructing new levees to allow new development, particularly along existing floodways increases flood risk by:

- sending flood waters downstream toward vulnerable urban communities,
- restricting the natural ability of floodplains to safely convey floodwaters,
- placing more people and property in harm's way so when the larger flood occurs or a when levee fails, consequences are greater than were the levee not there, and
- precluding floodplain restoration that could reduce flood risk for existing communities and restore ecological function.

While development in estuarine floodplains below sea level does not affect flood conveyance capacity, development of these deep floodplains is a serious threat to public safety and the structures “protected” by the levees. In most cases, a levee failure during the winter flood season could rapidly flood homes to depths of six feet or more with cold water at 55 degrees Fahrenheit or less. Despite the residual risk of catastrophic flooding, residents of new subdivisions are not subject to the National Flood Insurance Program (NFIP) requirements because they are behind FEMA-accredited levees. FEMA considers these developments “out of the regulatory floodplain.” FEMA does not require that homeowners are notified of this risk upon purchase, and does not require or proactively encourage residents to take actions to preemptively mitigate flood risk. In contrast, homeowners that are *not protected* by an accredited levee, are notified of the risk at purchase, must obtain flood insurance and are compelled to comply with other provisions of the NFIP such as elevating their structure above the 100-year flood level when completing a major addition.

¹ Riverine levees refer to those that are dry most of the time and only have water against them during higher flow periods. The driving factor of water surface elevations through riverine levees is the cross sectional area of the river channel.

² Estuarine levees refer to those that are wet all of the time, like those levees in the Delta that protect land below sea level. The factor driving water surface elevations of estuarine levees is sea-level.

Development in these deep floodplains significantly limits effective emergency response, increases the likelihood of death, and significantly increases property and financial damages. For, example according to the Sacramento Flood Emergency Evacuation Plan, the Pocket area is considered a “rescue zone” and not even an “evacuation zone” because it would flood to a depth of one foot within an hour precluding vehicular evacuation. Even flooding to a depth of 14 inches in commonly used concrete slab construction requires replacement of electrical circuits. Once water seeps into drywall, it must be replaced, and in the meanwhile, can create toxic molds that are very costly to remediate.

II. Increase conveyance capacity through constrained reaches in the Delta by flood bypasses, levee setbacks, floodplain restoration, .

Flood bypasses are strategic levee investments that route water around constrained reaches and toward undeveloped lands. Bypasses that route water away from high-value floodplain development are a particularly effective risk reduction strategy. The Yolo Bypass is a successful example of protecting urban areas from flooding by routing floodwaters away from the dense urban areas of Sacramento. Unfortunately, the Army Corps of Engineers reduced the capacity of the Yolo Bypass when they constructed the deep water ship channel in the 1960s. As a result, the Yolo Bypass was barely sufficient to convey the 1997 floods.

The Delta Stewardship Council should map cost effective levee setback opportunities in the Delta. Levee setbacks can provide important flood risk reduction benefits, but cost effective opportunities for levee setbacks are relatively limited in the Delta and therefore must be carefully targeted. Levee setbacks in flow constrained reaches can increase the conveyance capacity of the entire system, but levee setbacks in unconstrained reaches do not improve system capacity unless the setback extends for a long distance. Levee setbacks in the central Delta could provide important ecological and wave protection benefits, but they do not increase system capacity because flood stage in the central Delta is controlled by sea level. Levee setbacks are relatively expensive in the Delta, particularly along the Sacramento River where the river is bordered by urban development, infrastructure, and small parcels. Levee setbacks on subsided islands can also prove costly. Despite these limitations, there are multiple locations in the Delta where new setback levees could reduce long-term levee maintenance costs, increase conveyance, reduce wave action, and restore habitat.

Bypasses and setbacks are effective means of achieving both public safety and ecosystem restoration objectives. Both bypasses and setbacks provide numerous ecological benefits. First and foremost, they provide riparian and floodplain habitats critical to native fishes including juvenile salmonids and Sacramento splittail. Juvenile salmon that rear on floodplains grow three times as fast as salmon that rear in the main river and they are less susceptible to predation by exotic species. Bypasses and setbacks also slow velocities that erode and simplify channel habitat during extreme flood events.

There are a few key opportunities both in and through of the Delta to expand conveyance capacity and reduce flood risk.

Flood Bypass opportunities

- a. Expand the Yolo Bypass. At a minimum, restore the original design capacity of the Yolo Bypass, which was reduced by the deepwater ship channel. There is plenty of opportunity for substantially increasing capacity on both the east and west sides of the existing Yolo Bypass with only minimal land use conflicts.
- b. Ship channel bypass: Create a new bypass parallel to the deep water ship channel by building a new levee east of the channel. This would facilitate expansion of the Yolo bypass by obviating the need to upgrade the east levee of the Yolo bypass and would also create a new bypass that would both reduce flood stage along the Sacramento River and create a new floodplain corridor for migrating salmonids. A new bypass along the ship channel could also mitigate for any flood impacts caused by new intakes structures planned for a north Delta diversion.
- c. New South Delta bypass: Expand Paradise Cut to reduce flood risk, protect open space, and restore habitat. An expanded Paradise Cut would divert flood flows away from urbanizing areas in Stockton and Lathrop. Modeling analyses indicate that a significantly expanded bypass would reduce flood stage near Mossdale by 1.8 feet during a 100 year flood. Several local agencies including the South Delta Water Agency recently joined with American Rivers and the Natural Resource Defense Council to apply for a \$5 million flood corridor protection grant from the California Department of Water Resources to begin acquisition of easements along an expanded bypass alignment.

Levee Setback Opportunities

- a. Expand capacity and create habitat corridors along the San Joaquin, Old, and Middle Rivers in the South Delta.
- b. Setback or remove levees between Vernalis to Mossdale to attenuate flood flows to the central Delta.
- c. Acquire land and easements along the Sacramento River between Colusa and Natomas to begin a long-term program of levee setbacks necessary to restore riparian habitat, reduce levee maintenance, and improve flood protection for rural areas.
- d. Opportunities for levee setbacks between Natomas and Walnut Grove are limited and expensive due to existing development and infrastructure along the River but opportunities for levee setbacks in association with levee upgrades in West Sacramento and elsewhere are potentially promising
- e. Site specific levee setbacks along estuarine Delta levees to bolster vulnerable sections, reduce wave erosion, and restore habitat.

III. Reduce peak inflows into the heart of the Delta through upstream floodplain storage in rural basins

Reducing peak inflows into the Delta will reduce flood stage and thus flood risk for Delta communities like Sacramento, Lathrop, and Stockton. Upstream floodplain storage in rural basins on the San Joaquin River from Vernalis to Mossdale, in the San Luis Basin upstream of the Merced River, and also in various undeveloped basins along the Feather and Sacramento Rivers provide an opportunity to safely store floodwaters. These areas already tend to flood when upstream levees fail, thereby reducing the amount of floodwaters conveyed downstream to urban communities along the periphery of the Delta. In many ways, the Central Valley Flood System “works” for urban communities because the levees fail first in upstream rural areas.

Local reclamation districts have stepped up efforts to reinforce upstream levees with funds from the state and federal government to prevent flooding in rural areas. Improving these levees, however, will only send more water downstream, which increases risk for vulnerable urban communities downstream. Flooding these areas in a controlled manner during extreme events (>25-50 year events) is a safer way to manage floodwaters and reduce risk during the largest floods. .

Overflow basins to attenuate extreme floods is not a new idea. William Hammond Hall, the state’s first engineer, wrote in his report to the state legislature in 1882:

“And so it should be fully understood that floods will occasionally come which must be allowed to spread.” But they must be allowed to do so not in their ordinary way, by opening out crevasses in levees, but by putting strong weirs at several locations so that outflows could occur without causing damage. There should be one, for example, near Colusa. Once given release from the main channel, the overflowing water should be conducted “in embanked channels to the low basins whence it could be drawn out again so soon as the river would fall.”³

Efforts to manage rural flood basins as overflow areas during extreme events must be paired with efforts to minimize flood damage in rural communities and compensate these communities after planned flood events. To prevent activities that will direct increased flood flows to the Delta, the Delta Stewardship Council should require compensatory flood attenuation mitigation for all upstream levee improvements that would otherwise increase the peak flood volume conveyed to the Delta. In exchange for limitation on upstream levee improvements, the Delta Stewardship Council should require municipalities on the lower Sacramento and San Joaquin rivers to levy fees and insurance premiums on all new floodplain developments and improvements to finance use of upstream areas as overflow basins. Revenues collected should be used to “flood-proof” infrastructure in designated overflow areas and to establish an insurance pool to compensate landowners after flood events.

³ William Hammond Hall as quoted and paraphrased by Robert Kelley in *Battling the Inland Sea* (page 206).

IV. Minimize residual risk in existing communities behind levees, and where future development is already permitted, ensure that future risks are full disclosed and accounted for with sustainable financing mechanisms for future levee maintenance and improvements that will be needed as our climate changes.

In many cases, urban developments are already built, or have already been permitted for construction behind levees in the Delta and on its periphery. These developments however, are not safe and the Delta Stewardship Council should not imply otherwise by remaining silent or otherwise failing to manage this residual risk. Residual risk is the flood risk that remains (from larger floods) even when levees perform according to design. Even the best levees are prone to failure, which has led experts from William Hammond Hall in 1882 to Jeffery Mount in more recent times, to coin axioms worthy of Mark Twain. Professor Mount once observed that “only a fool would think levees are foolproof.” According to Robert Kelley, author of *Battling the Inland Sea*, William Hammond Hall’s 1882 report to the state legislature warned that “experience showed that there were two classes of levees: those that had been overtopped by floodwaters, and those that were going to be.”

The residual risk associated with urban developments behind FEMA accredited levees is very large. FEMA accreditation is based on the “100 year flood” safety standard, but most individuals do not understand that this means they have a 1% chance of flooding in *any given year* from larger floods (assuming the levee is properly designed, well constructed, and hydrology is stable). The probability that a larger flood will overtop a levee certified to withstand a 100-year flood is 26% over the course of a 30-year mortgage. The probability that a larger flood will overtop a levee certified to withstand a 200-year flood is 14% over that same 30-year period and actually 22% over 50 years. The odds get worse when one considers sea-level rise and the likelihood of larger and potentially more frequent storms as the climate changes.

It is critical to remember that in a large flood like the potential “ARk storm” scenario⁴, emergency response may be overwhelmed and unable to fully respond to everyone affected by the disaster, which means people may die. Disabled, sick, or elderly, individuals may not be able to evacuate even if given advance warning. Studies have shown that mortality increases as a function of inundation depth and there are many places in and around the Delta where inundation depths will exceed six feet.

FEMA accreditation assumes that levees will be properly maintained and that future hydrology will approximate previous hydrology. Both of these problematic assumptions will create future problems for people who buy houses in deep floodplains *protected* by levees. Funding mechanisms for new floodplain developments and infrastructure may not be sustainable or sufficient for upgrading levees in the future - straddling communities with either the cost of flood insurance or increased taxes to finance improvements. These new fees may be manageable for economically healthy communities, but could prove devastating for struggling

⁴ See United States Geological Survey Report on extensive flooding due to a plausible Atmospheric River Storm (http://pubs.usgs.gov/of/2010/1312/of2010-1312_text.pdf)

communities, particularly in unfinished subdivisions now common in and around the Delta. Home owners in unfinished developments within a larger reclamation district that does not have sufficient revenue to maintain levees to FEMA 100-year standards are faced with either financing levee improvements for an entire district by themselves, or becoming remapped by FEMA as “floodplain,” and subject to the NFIP requirements.

The potential for unfinished new developments could leave reclamation districts and struggling homeowners without the resources necessary to maintain or improve levee and drainage infrastructure. Following permitting, developers pay the initial costs of infrastructure and levee improvements. The local municipalities often assume that the revenue stream to finance long-term maintenance and improvements to levees and drainage infrastructure will come from future tax revenue and property assessments from a fully built-out project. In difficult economic times, however, many of these developments may not be fully built-out for a decade or more resulting in insufficient tax revenue to finance the levee and drainage services needed by an entire district. Similarly, if future property values are lower than originally anticipated, the developments may not generate enough revenues to finance levee and drainage improvements that will be necessary to respond to climate change.

The increased fees combined with the increased probability of flooding under climate change will create a downward spiral in real estate values and property tax revenues. This downward spiral may have already begun in many floodplain developments along the periphery of the Delta. Foreclosure rates are among the highest in the nation, and a new report by the Brookings Institute documents an alarming trend of increasing poverty rates in the outer suburbs. New levee fees and regulations will only exacerbate the problem, but failing to upgrade levees would be even worse.

Regardless of the safety standard or planned levee maintenance, every levee will fail at some point and the consequences will be catastrophic on the deep floodplains in and around the Delta. Therefore, we recommend a number of actions that Council must require cities and counties adopt in order to reduce the risk of catastrophic flooding on land behind levees.

A. Development strategies for managing residual risk in developed areas on all floodplains

- 1) Mandatory flood insurance for all levee protected areas with graduated premiums that increase based on inundation depth. Purchasing flood insurance also raises awareness that this property is subject to inundation.
- 2) Residential building design must minimize first floor damages. All structures must be elevated above projected base flood elevation if a levee failed Even minimal inundation may require drywall replacement therefore only storage on the ground floors.
- 3) Oil and gas heaters are not permitted on lower floor.

B. Development strategies for managing residual risk considering that emergency response may not materialize

- 1) All residential buildings must have two stories. In many cases, an entire first floor will be flooded and there will be no safe place to be during high waters.
- 2) All residential buildings must have a built-in vertical evacuation route. In most situations, and like in Hurricane Katrina, the only safe place was out and onto the rooftop. This is best for helicopter evacuation and necessary to get out of a flooded house.
- 3) All residential buildings must have a boat in the attic. In some cases in the aftermath of Hurricane Katrina, the only way people escaped was because they had a boat or knew someone with a boat because the emergency responders simply could not rescue everyone. Local emergency services are not adequately prepared to perform mass water rescues. As such, some people could be stranded for days surrounded by cold waters. Individual boats would decrease the load on local emergency services and increase survival rate.
- 4) Living quarters/bedrooms are not permitted on the lower floor—only vehicle and storage. Given these areas will flood rapidly—in some cases to one foot deep in an hour, ground floor residences are inappropriate because it may not give unsuspecting residents time to get to safer ground—particularly if a levee breach happens during the night.
- 5) All subdivisions must have high ground for safety, cross levees, and elevated evacuation routes. Evacuation routes are only useful if they are accessible and above the high floodwaters. (See “Hafencity,” Hamburg, Germany for example)
- 6) Subdivisions must have emergency shelters that are clearly marked and on high ground. People must know where the emergency shelter is with plenty of signage, and it cannot be in areas that will be inundated by a flood.
- 7) Developers must have a pre-placed contract for emergencies prior to any house being sold. Often local districts have trouble with access to emergency contractors because they have already been spoken for. This will help take some of the burden off of counties, logistical discrepancies, and improve response time in an emergency.

C. Levee Safety Standards:

- 1) Developments protected by levees must ensure that levees are current and in accordance with the National Levee Safety Program.
- 2) Levees must undergo assessments at least every five years to ensure compliance. There shall be funded by an endowment in perpetuity.
- 3) Municipalities must prove that the levees meet new standards by providing documentation in a rigorous and *transparent process*. There must be an opportunity for both public and peer review before decisions are made and permits issued.

D. Landowner Notification

People moving into areas with residual risk deserve to know they face a risk and people selling property in these areas have an obligation to inform future residents before they make the decision to move. Without the right information, potential residents are not able to (a) take precautionary measures and prepare for a disaster (which increases the likelihood they will die or suffer more costly damage), or (b) choose to live somewhere else.

Therefore, if the Delta Stewardship Council is not in a position to prohibit floodplain development in these areas (which is the best course of action), the Council can do a number of things to inform people of the risk they face by moving into an area protected by a levee. Informing people of a risk is a necessary step toward risk reduction.

- 1) Prior to a transaction, landowners of every property sold in this area must sign a statement that reads: “I acknowledge that the Delta Stewardship Council has deemed my property subject to catastrophic flooding.”
- 2) Real Estate agents here are required to disclose that these houses are behind levees and subject to rapid and deep inundation. Failure to do so is a penalty of lost real estate license.
- 3) All model houses must have signs disclosing the area as behind a levee and subject to deep, inundation.
- 4) All model homes must have a projected high-water marker posted on the front door.
- 5) All subdivisions must have projected high-water markers posted on lampposts/street signs. Constant reminder that the development is subject to flooding helps keep the risk in the consciousness of residents. It also lets future homebuyers know the area is at risk.
- 6) Street signs must be named after levees or the reach of the river. Constant reminder that the development is subject to flooding helps keep the risk in the consciousness of residents
- 7) Levees must be named with signs posted.

E. Sustainable funding mechanisms for levee maintenance in development districts behind levees

- 1) Municipalities that approve any level of floodplain development must require upfront escrow accounts that are adequate to maintain levees within an urbanizing district indefinitely. To avoid saddling struggling communities with financing necessary levee improvements in unfinished developments, municipalities must establish a sustainable funding mechanism that is not dependent on speculative development in the future. As properties are sold, the municipality may only withdraw money out of the account as it is replaced simultaneously with new monies and the account must remain fully funded until the entire development is built.